



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

ON A NEW FORM OF SECTION-CUTTER.

BY WILLIAM A. ROGERS, A. M., F. R. M. S., Cambridge, Mass.

It is not my purpose in this brief paper to enter upon a discussion of the general problem of the best form of a section-cutter, but rather to point out a method by which greater certainty can be obtained in cutting a section of any required thickness. Hence I shall have nothing to say concerning the best form of the cutting knife, or of its mounting, or of the best method of holding the specimen in position while the work is being done.

In every form of instrument known to the writer there is great uncertainty in the *mechanical indication* of the thickness of the section. In the form which seems to meet with the most favor at the present time the motion is secured by a wedge driven by a screw. Now the *theoretical* accuracy indicated by this method is very great, but I have yet to learn of any actual tests by measures of the work done. Theoretically the ordinary form of construction is open to objection, on account of the number of parts of the mechanism by which the increment of motion is given, and there is always a certain amount of uncertainty with reference to the rigidity of the apparatus during the operation of cutting.

The following method of construction was suggested by the use of an electric clamp, which has proved wholly successful in the dividing engine constructed for me by the American Watch Co., of Waltham, Mass. Two magnets are attached to an arm which rests upon the axis of the screw, the cores of which are filled to the periphery of the index of the screw. The end of the arm moves between the stops, the lower one being fixed and the upper one being adjustable by a screw movement. A third magnet is attached to the bed of the machine, the cores of which press lightly upon the

periphery of the index. During the upward movement of the arm the lower magnet holds the index firmly in position, preventing any movement of the screw. After contact has been made in the upper stop, the circuit is completed through the other two magnets, and as the arm thus becomes rigidly attached to the index, the downward movement of the arm carries the index with it an arc of revolution which is governed by the distance between the stops. In practice the operation of this clamp is simply perfect. Theoretically the action is also perfect. Disturbance of position is only caused by motion, and where there is no motion there can be no disturbance of position. Since the magnets always rest upon the wheel, there can be no motion between them and the index when the circuit is completed, hence there can be no disturbance of position.

The same principle has been employed in the investigation of the errors of the great Meridian Circle of Harvard College Observatory. With the aid of water buffers to neutralize the shock of the contact of the arm with the fixed stops, it has been found possible to make repeated contacts without any measurable error under a magnifying power of about six hundred.

Another form of application of the same principle was employed in the comparator built for the Physical Laboratory of Princeton College. New tree-ways upon which the microscope plate moves are the cores of very long magnets. It was found that the pulling force required to move the plate under the action of a current developed by four bichromate cells was about 135 lbs. It was this particular apparatus which suggested the form of section-cutter which will now be described. The proposed apparatus consists of only five essential parts, viz: (a) A bed-plate of iron about fifteen inches in length by six inches in breadth, having elevated walls on each side and running the entire length. The cores of two or more magnets project through this bed-plate, being fastened beneath.

(b) A rectangular plate moving freely between the walls of the bed-plate, and resting directly upon the cores of the magnets.

(c) A microscope arm attached to the bed-plate in such a way that a ruled metal plate attached to the moving plate can be brought under the objective.

(d) A simple means, either by a lever or a screw, of running the rectangular plate over any distance indicated by the scale.

(e) The mechanism for holding the object upon the rectangular plate and for moving the knife. A downward shearing motion of the knife, similar to the action of a paper-cutting machine, would, I think, give good results.

The object being mounted for cutting, each increment of motion is obtained by moving the rectangular plate over a given distance under the microscope. There can be no mistake about the magnitude of this motion, because it can be at any time verified by reading the scale. In order to fasten the plate, preparatory to the operation of making the section, we have only to turn a switch and complete the circuit. By the principle employed there can be no disturbance during this operation, and this fact can be verified by again reading the scale.